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The development of a course of study for industrial arts in grades one through eight, which was based on material presented on state adopted basal textbooks, was the purpose of this project. Instruction resulting from the course of study was to serve six functions: social, cultural, consumer, recreational, occupational, and technical. Specific project objectives were to extract and organize material from the texts and to dev'lop a course of study keyed to texts and suggested reference materials. Topics keyed to these books were organized under six headings for each grade: (1) Communication, (2) Construction, (3) Manufacturing, (4) Transportation, (5) Power, and (6) Service. Following this a course outline was developed for each grade from these topics, if they met five stated criteria. The outlines include text and reference keys and suggested activities for each topic. The bibliography lists 84 textbooks and 48 supplementary references. (EM)

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The Development of a Course of Study for Industrial Arts Education at the Elementary School Level

by
William R. Hoots, Jr., Ph.D.
East Carolina University
Greenville, North Carolina

August, 1968

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CHAPTER I

SUMMARY

The Problem

The problem to which this study was directed was the development of an industrial arts course of study for the elementary grades of one through eight based on material presented in the textbooks on the North Carolina elementary school basal adoption. This was expected to provide a course outline of references to technology and industry that would serve as a basis for instruction in industrial arts for these grades.

Objective

The objective of the study included the development of a course of study for instruction in industrial arts that would help children to become oriented to our industrial and technological environment. This instruction was to serve by the following six functions: (1) Social, (2) Cultural, (3) Consumer, (4) Recreational, (5) Occupational, (6) Technical. The social function would aid in the development of self-expression, the development of personal competency, and in the discovery of self. The cultural function would be concerned with the development of understanding and appreciation of the American culture as it has been influenced by man's mastery of materials in his efforts to control his environment through technology. The consumer function would aid in the development of skills necessary for wise choice of consumer products and services. Social changes in our culture have provided man with more and more leisure time, and he is in need of wholesome activities with which to fill this time. Industrial arts can help him understand this phenomena and to cope with the problems related to it while providing skills appropriate for leisure time activities. The occupational function of industrial arts would provide an orientation to the ways by which man earns his livelihood in occupations involving technology. The technical functions would acquaint pupils with the tools, machines, and processes by which man has improved his welfare in his attempts to master his material environment. In addition to these, it is expected that the study of industrial arts would help the child to develop a keen sense of perception resulting in a deeper understanding and appreciation of what goes into the production of technological products and services and of all aspects of our technological phenomenon of our environment.

The following were specific objectives for the study:

1. The extraction of elements of industry from elementary school textbooks.

2. The organization of this material, by grade, into an orderly and systematic course outline.

3. The development of a course of study including references to text and suggested supplementary materials for an industrial arts program.

Procedure

"Elements of industry" were identified and extracted from the elementary school textbooks on the North Carolina basal adoption. These elements were organized into a course outline which was presented in tabular form showing textbook references for each phase of the outline. Analysis of this outline, however, indicated that there was considerable repetition between grades, and further refinement was made.

This outline was revised in accordance with the judgement of the principal investigator and the following criteria:

Criterion One: Any specific area studied repeated in the course for adjacent grades should be eliminated.

Criterion Two: An area to be retained should be done in the grade that has the greatest amount of reference in that area.

Criterion Three: An area to be retained should have the reference from the greatest number of different sources.

Criterion Four: An area to be retained should be so done at the grade level where children will be able to efficiently participate in activities appropriate to that area.

Criterion Five: Any additions to the course outline should be related to areas in the outline for the grade immediately preceding and following that grade, and they should contribute to the relatedness of the material in the respective grades.

The revised outline was presented in tabular form giving the course outline, references, suggested activities, and supplementary references.

Findings

The result of the study was an outline of elements of industry which should be incorporated into the curriculum at each grade in the elementary school in order to help the child develop an understanding of the technological aspects of the environment in which he lives. The following is this outline:

Grade I

I. Transportation
    A. Land - Truck, Auto, Bus, Train

- B. Air - Airplane
- II. Manufacturing
  - A. Saws - Crosscut, Coping, Back
  - B. Hammers
  - C. Painting
- III. Service
  - A. Automobile
  - B. Carwash
  - C. Street Cleaning
  - D. Mail

Grade II

- I. Communication - Telephone
- II. Construction
  - A. Houses - Materials
- III. Power - Air, Steam, Wind
- IV. Service - Milkman, Snowplow, Fire Fighter

Grade III

- I. Manufacturing - Iron, Glass, Paper, Clay, Food, Textiles
- II. Power - Simple Machines, Electricity
- III. Transportation
  - A. Land - Trucks, Trains
  - B. Air - Airplanes, Helicopter, Rockets
  - C. Water - Ocean going ships

Grade IV

- I. Power - Wind, Animal, Water, Steam, Gasoline, Electricity, Rocket, Atomic
- II. Transportation
  - A. Land - Rolling (Wheel, Friction, Bearings), Sled, Bicycle, Train, Auto, Bus, Truck
  - B. Air - Airplane, Helicopter, Rocket
  - C. Water - Boats, Ships, Submarines
- III. Construction - Houses of different lands

Grade V

- I. Construction
  - A. Materials
  - B. Railroad
  - C. Roads
  - D. Water related - Canal, Harbor, Locks, Dams, Fish Ladder, Bridge
- II. Manufacturing
  - A. Food Products
  - B. Wood Products
  - C. Textiles
- III. Power

    A. Hydroelectric - Production, Use
    B. Electric

Grade VI

- I. Communication
    - A. Writing
    - B. Electronic - Radio, Television
    - C. Electrical - Telegraph, Telephone
- II. Construction - Houses, Bridges, Roads
- III. Manufacturing - Metals, Glass, Clay, Chemicals, Petroleum, Coal
- IV. Power
    - A. Engines - Gasoline, Diesel, Rocket, Jet, Turbine
- V. Service - Water System

Grade VII

- I. Communication - Newspaper, Photography
- II. Construction - Houses, Bridges, Roads
- III. Manufacturing - Metals, Wood Products, Tobacco

Grade VIII

- I. Manufacturing - Wood Products, Food Products, Textiles
- II. Power - Animal, Wind, Water, Electric, Atomic, Petroleum, Coal
- III. Transportation - Land, Air, Water

Conclusions

The major conclusion drawn from this study was that there are references to industry and technology in the elementary school textbooks on the North Carolina basal adoption. (It is assumed that similar references could be found in other elementary school textbooks.) Authors of these books have attempted to have them reflect the nature of contemporary society, and in so doing they reflect technological aspects of present day society.

This study provides a course outline for industrial arts at the elementary school level which can be integrated with the curriculum in any of North Carolina's elementary schools using the textbooks on the state basal adoption. It must be concluded that this course outline will have the most benefit for elementary schools in North Carolina, but it provides a basic outline of elements of industry that should be appropriate in any elementary curriculum.

The incorporation of this outline into the course of study for elementary children will result in better education. Through the study of industry and technology, children can learn about the world in which they live, and they will grow up into more useful and productive citizens.

CHAPTER II

BACKGROUND FOR THE STUDY

The problem to which this study was directed was the organization and development of an industrial arts course of study for the elementary school grades. This will provide a program in the elementary school curriculum aimed at acquainting the child with the technological phenomena of our society and of preparing him to live effectively in such a society.

Industrial arts education, as defined by this writer and for the purposes of this study, is the study of technology leading to the development of understandings and appreciations of our culture and the attainment of knowledge and skills necessary for effective participation in a technological society. Industrial arts, then, is that segment of the school curriculum dealing with the study of technology and having the responsibility of acquainting youth with the nature of the technological culture in which they live and of assisting each in discovering his place in, and his relationship to, this technological culture. Industrial arts is vital to the education of all youth at all levels of education, because only through this kind of instruction will American youth be prepared to meet the challenges of our ever-changing technological culture. It is imperative that industrial arts instruction be provided for all children at the earliest age of formal education in order that they might discover the many opportunities that this society holds for them.

This philosophical basis is in complete accord with the generally accepted objectives of elementary school education, but its emphasis is on the study of industry. The primary purpose of education in any society is to acquaint youth with the nature of the culture in which they live and of which they are a part. The school must provide meaningful experiences that will enable each child to perceive his environment in a manner in which he can associate himself with the environment and to the satisfaction of his personal objectives.

Too often modern education delays instruction in the sociological and cultural factors that affect every facet of life. Introductory phases of this instruction should begin with the beginning of formal education, for it is at this point that the foundation of all subsequent learning is formed; this foundation is necessary if a functional education is to be achieved. Industrial arts education is an integral part of the study of these sociological and cultural factors that affect life, and it is necessary that it be included at this early level of education.

The American culture today is distinctly and uniquely technological. Technology is defined by Dr. Delmar Olson, Chairman of Graduate Studies at North Carolina State University in Raleigh, North Carolina, as being the result of the interaction of man, mind, materials, and energies. It is the record of ideas expressed in materials; it is man controlling nature and man mastering his environment. As compared with science, which is defined as the source of pure theory and principle, technology is the origin of science. Theory is developed only when man seeks to solve a problem and becomes involved with the interaction of mind, materials, and energies. Technology is the origin of science; through it science becomes useful and functional. Technology is the force producing revolution in culture--that force which produces cultural change.

It is these cultural changes that have brought about many of the social and cultural problems of our time. Modern man has been caught up in a technological revolution that has created thousands of new jobs, made obsolete thousands of old ones, created employment opportunities for which there are no qualified persons available, and left many unemployed, unqualified for existing jobs, and dependent upon society for their survival. Uncertainity and fear have developed from lack of security that has caused many social problems. An understanding of the forces behind these social changes, the technological phenomena of our society, and guidance toward finding a place in our society are needed to conquer this fear and unrest.

Industrial arts cannot solve all the problems of society, but it can help all who have the opportunity to study about technology to better understand the world in which we live and to better cope with the problems they must face. A person with interest in worthwhile leisure-time activities is not likely to become involved in acts of delinquency. One with a knowledge of industrial products and services will be a more intelligent consumer, and one with an understanding of the changing nature of work will be better able to adapt his occupational goals to ends that he will find satisfying. Dr. Olson (11, p.1) describes the benefits of industrial arts education in terms of functions. The following are six areas of living in which this instruction functions to meet the educational needs of youth: (1) social, (2) cultural, (3) consumer, (4) recreational, (5) occupational, and (6) technical. The social function aids in the development of self-expression and the development of personal competency. It aids the child in the discovery of self and in personal development. The cultural function is concerned with the development of understandings and appreciations of the American culture as it has been influenced by man's mastery of materials in his efforts to control his environment through technology. Social changes in our culture have provided man with more and more leisure time, and he is in need of wholesome activities with which to fill this time. Industrial arts can help him to understand this phenomena and to better cope with the problems related to it while providing skills appropriate for leisure-time activities. The consumer function provides for an enlightened utilization of the products and services of and related to technology. The occupational function of industrial arts provides an orientation to the ways by which man earns his livelihood in occupations involving technology. The technical function acquaints pupils with the tools, machines, and processes by which man has improved his welfare in his attempts to master his material environment.

In addition, industrial arts has an asthetic value. Through the study of technology, pupils develop an awareness of the wonders of life so often taken for granted. This study of industrial arts helps to develop a keen sense of perception resulting in a deeper understanding and appreciation of what goes into the production of goods and services and of all aspects of our technological environment.

Textbooks written for today's elementary school children contain much information about the new and evolving world in which they are being prepared to live. Authors of these texts are aware of the changes that are taking place in society, and they have provided text material for the study of some of these changes. There is no evidence that this material is organized so that similar elements of industry will be studied at the same time in various subjects such as language arts, science, and social studies; but, at least, the study of this important segment is included in the textbooks.

Today's teachers are charged with the responsibility of providing our children with the education necessary for living in a changing technological society. These teachers have lived most of their lives in a sheltered academic environment, and they know little about the world of work for which they are attempting to prepare youngsters. The foundation for further education is developed in the elementary school, and here children only learn about the phases of society which are academically oriented. Teachers tend to teach that which they know best and thereby perpetuate their own kind. This is one of the reasons why there is so much confusion among secondary school pupils as to what kind of preparation they should have, and it is one of the greatest reasons for the drop-out rate at all levels. These pupils have been lead down the narrow path of academic education wearing blinders that have prohibited them from attaining a broad educational experience in and with all aspects of social living.

Teachers in modern elementary schools need preparation that will help them to better understand the phases of society in which they have had little experience. They need to learn how to interpret information about industry that is in the textbooks and to apply it in a meaningful program that will involve the physical, as well as the mental, nature of each child. The teacher should learn to carry out laboratory activities related to these elements of industry in order to provide effective learning.

The major problem in the area of industrial arts for the elementary school is the development of a workable course of study for this level. This logically falls into the following four divisions, the first of which is the major concern for this study:

(1) The identification and organization of the elements of industry included in elementary school textbooks and the development of a workable course of study for industrial arts for the elementary grades from these elements of industry.
(2) The development and administration of both in-service and pre-service programs of industrial arts education to prepare elementary teachers to teach industrial arts in their classrooms.

(3) The development of pilot programs to experiment with, test, and validate this curriculum and to work out problems of its implementation.
(4) The implementation of the program of elementary school industrial arts in public elementary schools.

Before much can be done toward teacher preparation, testing, or implementation, course content must be developed for each grade level. The following is the specific problem to which this study was directed: the development of a specific course of study for industrial arts education in the elementary school grades of one through eight by extracting and organizing the elements of industry found in approved textbooks for these grades.

Objectives

The following were the specific objectives for the study:
(1) The extraction of elements of industry from elementary school textbooks.
(2) The organization of this material, by grade, into an orderly and systematic course outline.
(3) The development of a course of study including references to texts and suggested supplementary material, for an industrial arts program.

Basic Assumptions

The following are the basic assumptions under which the study was conducted:
(1) That children should study about the technological aspects of our society and of our culture--the subject matter of industrial arts.
(2) That textbooks for elementary children in the various subject matter disciplines contain references to industrial technology appropriate for the basis of an industrial arts course of study.
(3) That references to technology--elements of industry--extracted from elementary school textbooks can be organized into a sequential and meaningful course of study for industrial arts at the elementary school level.

Limitations

Time, in relation to the total length of the project as well as the amount of time available to spend on such a project, was one of the major limiting factors of the study. Also, time during which the project was conducted, from February, 1968, through August, 1968, came at a time when changes were being made in the North Carolina State textbook adoptions and caused some of the references to become obsolete while others adopted for the 1968-69 school year could not be included in the project. However, the researchers found that there was no time when a project such as this could have been conducted that would have provided a course of study based on current adoptions in time for any beginning school year unless it would be an on-going revision of such a project as this. This is due to the continually changing textbook adoptions.

In addition to the limitations of time, intellect, and talent, the following are delimitations of the project:

(1) Textbook references upon which the course of study were based were delimited to those on the North Carolina elementary school basal textbook adoption list.

(2) References for supplementary text material for the industrial arts course of study were delimited to those which were readily accessible to the project staff. Consequently, the supplementary bibliography cannot be considered to be complete, but it is merely a recommendation for a few references.

Review of Related Literature

No references were found in the literature dealing with the specific problems of this study--the development of an organized course of study for elementary school industrial arts based on elementary textbook material--were found. There are, however, many contributions to professional literature that substantiate the position of the researcher. In an article entitled "Industrial Arts for the Elementary School," Dr. Donald F. Hackett (7, p. 61) says,

> This purpose (objectives of elementary school education) to orient the school program in the world of work...is based on the hypothesis that the world of work can be used effectively as a framework to unite and direct educational efforts. It stems from the belief that unless the school program accurately reflects work as a part of our culture, it cannot purport to transmit our culture. Without this orientation boys and girls cannot intelligently select and pursue a program of studies that will permit the development of their maximum potential. Consequently, occupations in industry--the world of work--should be a recognizable influence in the content and structure of the entire school program.

Dr. Mary-Margaret Scobey (14, p.24), professor of education at San Francisco State College, further indicated that industry should be a part of the elementary school curriculum when she said,

> ...to interpret industry, children need to consider not only processes, tools, and materials, but also products, occupations, and work patterns, accumulated knowledge and problems of life related to industry, and the means by which man has adapted his physical environment to serve his needs.

Dr. Donald G. Lux (9, p.8) supports this idea that industry should be reflected in the elementary school curriculum when he says,

> ...there is evidence that the apparently aimless search for suitable elementary school activities has been given direction and purpose by changes in our economy, our society, and professional education which belatedly indicate that some of these activities should be industrially oriented, provided in every elementary classroom, and related to the total elementary program. Professional direction is still lacking, but the growing need will doubtless force activity on many fronts. Perhaps the work by Comenius, Locke, Rousseau, Pestalozzi, Bonser, and Russel will culminate in a dynamic type of activity program suitable to the needs of modern youth. Perhaps we are finally approaching the time when the nature, scope, and purpose of elementary school activities will be concisely defined and generally accepted.

Industrial arts at the elementary school level is not another subject to be added to an already crowded curriculum; it should be an integral part of the already established curriculum--an enrichment to that which we now have. This is amplified by Dr. Carl Gerbracht and Dr. Harold Gilbert (4, p.2) when they say that its "...purpose is to assist in the achievement of the generally accepted goals of elementary education." Dr. Walter R. Williams, III (16, p.54), in his article "Studying Industry in the Grades," agrees when he makes the following statement:

> Elementary school industrial arts must be concerned with modern day technology, because the main goal of elementary school industrial arts is to reinforce and supplement the elementary curriculum.
>
> ...
>
> If elementary school industrial arts is to contribute to its fullest extent in the development of American youth, it must be concerned with helping students develop an understanding of present-day society of which he is to be so intimately a part.

Dr. Robert G. Thrower (15, p.198) further supported the position that industrial arts should be a part of the elementary school curriculum in an address at the 1967 American Industrial Arts Convention:

> ...I am firmly convinced that technology and its implementation through industrial arts activities should be integrated into the very core of the curriculum of every grade level beginning with kindergarten. Elementary classroom teachers must be trained in the use of tools and materials of industry. They must also be trained in the methods of utilizing industrial arts activities. Industrial arts specialists must be trained and employed by elementary school systems, and the necessary tools, materials, and working areas must be provided.

A good industrial arts program at any level can have many values and benefits for pupils who receive this instruction. Dr. Marshall Schmitt (13, p.11), specialist in industrial arts for the U. S. Office of Education, says that industrial arts has the following five values for children: (1) economic, (2) social, (3) educational, (4) human, and (5) cultural. The economic value comes from an understanding of the many occupations and being able to select a field of employment that will be meaningful and beneficial to the individual. Also, it is derived from understanding products and procedures of fabrication in order to more intelligently and economically utilize the goods and services of industry. The social value is derived from experiences of working together in a situation similar to that in which one will find himself in industrial employment. The human value is gained through the development of creative skills, the development of attitudes, pride in workmanship, and the desire to do a job well. Also, the human value is obtained through the understanding of self in light of technology in our contemporary society. The cultural value of industrial arts is gained through the understanding of the development of our culture, an understanding of its nature today, and an understanding of the direction in which it is going.

The literature clearly indicates that industrial arts, as a study of technology and its effects on our society, needs to be studied at all levels of education. Industrial arts experiences should first begin in the earliest form of a child's education and should be continued throughout his formal education in order to help him to orient himself to the world in which he must live. To this point, contributors to the literature are in agreement. However, the nature of industrial arts at the elementary school is not clearly defined in the literature. Some think of it as a method of teaching--a manipulative method--appropriate for any subject in the elementary curriculum. Others look at industrial arts at this level as an arts and crafts or handicrafts type of subject, while still others see it as a discipline within itself that should be either correlated or integrated with other phases of the curriculum.

Harold J. McWhinnie, a former instructor at the University of Chicago laboratory school, indicates that industrial arts at the elementary level should be an introduction to tools, materials, and processes. He says (16, p.56),

> Our shop program is basically one of woodworking and of work with hand and power woodworking tools. Experience is also offered in ceramics, printing, sculpture, and metal, but all of these are of secondary interest to the problem of design in wood. The correct and safe use of power and hand tools is, of course, one of our first and most critical concerns since we are dealing with very young children.

There is very little reference in current industrial arts literature to handicraft programs; however, when industrial arts is mentioned to a group of teachers or parents, the first thing that comes into their minds is something in the nature of handicrafts. One writer, Robert Babcock (2,p.138), when listing some of the things that children do in an industrial arts program, says,

> ...In some programs children construct items that are of particular interest to them (or to their teachers). Toys, games, gifts, and other "useful" objects are constructed. Sometimes there is a flavor of the arts and crafts approach here with emphasis on manipulation and experimentation with many media. Usually, a part of this type of program includes basketry, boondoggling (working with lacing materials), clay work, weaving, and other "crafty" experiences. All children have identical experiences, and there is usually little, if any, relationship to the work of the general curriculum.

The majority of writers in the field of elementary industrial arts seem to feel that it should be some kind of an integrated program in which industrial arts emphasizes the technological aspects of the school curriculum, promotes interest and motivation to facilitate better learning in the other areas of the curriculum, and provides a manipulative method in which the children are actively involved in the process of learning other subjects in the elementary school curriculum, such as science, math, or social studies. To the extent that industrial arts improves learning in other subject matter areas, these proponents of an integrated curriculum see industrial arts as contributing as much to teaching method as to a subject matter area. In writing about the integration of industrial arts and social studies Carl Gerbracht (5, p.199) says,

> At the present, most elementary programs involve a study of the cultural heritage, including many of its industrial aspects. Indeed, it is difficult to imagine teaching social studies without reference to the arts of industry which have played so vital a role in establishing our social order. But it should be noted that this is often attempted without providing any manipulative experiences with tools and materials. The story of our people engaged in mining, lumbering, power production, construction, manufacturing, transportation, communication, and other industrial pursuits can be told with words alone, but to do so denies the greatest lesson of modern psychology. How much more likely our pupils are to appreciate the significance of industry when their own hands perform many of the same tasks!

W. R. Miller (10, p.21) discusses the role of industrial arts in the elementary school and emphasizes the point that industrial arts should be completely integrated with the total elementary school program. He says,

> Industrial arts, as a term which indicates a study of the tools, materials, processes, and products

> of industry, is inadequate in describing the role of "construction activities" in elementary education. Industrial arts must lose its identity as a subject matter field if it is to make its greatest contribution as a means of implementing the generally accepted goals of the elementary school program. The focus of attention is not to be placed upon the study of tools, materials, and processes of industry, but rather should be concerned with the bringing of increased meaning and understanding to units of instruction through group or individual "constructional activities."

Donald F. Hackett (7, p. 61), in discussing this same point, says,

> This proposal to orient the school program in the world of work, while neither new or novel, is based on the hypothesis that the world of work can be used effectively as the framework to unite and direct educational efforts. It stems from a belief that unless the school program accurately reflects work as a part of our culture, it cannot purport to transmit our culture. Without this orientation, boys and girls cannot intelligently select or pursue a program of studies that will permit the development of their maximum potential. Consequently, occupations in industry--the world of work--should be a recognizable influence in the content and structure of the entire school program.

Another writer, Glenn S. Duncan (3, p. 19) , continues to support this point of view when he says that,

> Working with construction materials and using tools and processes, the clever teacher can cultivate interest in a study of these basic needs and exact some performance from the children to promote reading, writing, speaking, and other regular subjects. ...Each of these items suggests some investigative reading, maybe a written or oral report. Geographic locations or sections of the country where such industries prevail can be pointed out on maps and some insight can be given into the lives of the people who work and make these materials possible... This kind of approach and interpretation does not rule out other intrinsic values of the constructional activities--consumer information, appreciations, and acquiring skills with tools. Manipulative skills are somewhat incidental at this stage and secondary in importance...

Most of these writers who support an integrated approach agree that elementary industrial arts should be the study of industry, tools, and the technological aspects of our society. Harold H. Gilbert (6,p.1) indicates that industrial arts is a discipline within itself when he says that,

> Industrial arts is a study of production, consumption, and recreation in a technological society. This study can be started in the kindergarten and carried on in the classrooms throughout the elementary school grades.

Robert G. Thrower (15, p.198) says that,

> The modern concept of teaching in the elementary school relies heavily upon the unit approach. This approach crosses traditional subject lines and unifies them into an integrated unit of learning. Industrial arts can be either brought into a unit to aid the correlation of subjects or it may be a basis of the unit with which other subjects are integrated...

From the literature reviewed, the following conclusions must be drawn:

(1) That industrial arts is a subject matter discipline to be studied in the elementary grades, and it deals with the technological aspects of our environment and its effects on daily living.

(2) That all preparation for living in our contemporary society is related and, consequently, all learning should be related at the elementary school level. This, then, indicates that industrial arts--the study of technology--should be related to all units within the curriculum.

(3) That the teaching of elementary industrial arts should be a conscious effort to identify the elements of industry in units of study in the various curriculum areas of the elementary school program and to make a positive attempt to teach children about these facets of our technological society.

(4) That industrial arts at the elementary school is appropriately taught when integrated with other subjects, within units of study or when it is taught separately but correlated with other subjects being studied.

CHAPTER III

PROCEDURE

The nature of industrial arts at the elementary school level indicates that a course of study cannot be developed until references to industry in the curriculum are identified. These, to which we will refer as "elements of industry," are the basis of an integrated or correlated industrial arts program.

In this study these elements of industry were extracted from textbooks on the North Carolina basal adoption list for elementary grades of one through eight.

Each of the books on this adoption was read by research assistants who identified and extracted all references to industrial arts. These references were recorded by voice on magnetic tape.

Each element of industry was recorded on a special form for this. (This form is shown in Appendix A.) This provided for such information as the grade, the subject being studied, the name of the textbook, the unit of study within the textbook, the element of industry, a brief comment about the reference, and the pages of the specific reference. These cards were filed by grade and according to six basic classifications of industry: manufacturing, construction, communication, power, transportation, and service. Upon completion of the extraction of these elements of industry, they were organized into a course outline for each grade.

The course outline was presented in tabular form showing the references for each phase of the outline, suggested activities for each phase, and suggested supplementary reading material for each phase. The result of this analysis was a course of study for elementary school industrial arts. This course of study is designed so that the elementary pupil may begin learning the basic elements of technology at the beginning of his education in the first grade and will continue to build upon these to the point where, at the end of his elementary school years, he will have a good understanding of the basis of our technological society.

PERSONNEL

The director of the project was Dr. William R. Hoots, Jr., who holds the B.S. and M.A. degrees from Western Carolina College and a Ph.D. degree from The Ohio State University. He is an associate professor in the Department of Industrial and Technical Education at East Carolina University, Greenville, North Carolina, and has taught elementary industrial arts courses both at East Carolina University and The Ohio State University.

Dr. Hoots has been named consultant and chairman of staff for a Bertie County Title III ESEA elementary industrial arts project which has been designed to implement the course of study developed through this program.

Dr. Hoots is the author of several articles published in national journals, and he has been active in local, state, and national professional organizations. Included in these are the American Industrial Arts Association, the American Council on Elementary School Industrial Arts, and the American Council on Industrial Arts Teacher Education.

Gurney E. Pittman served as chief research assistant for the project. He holds the B. S. and M. A. degrees from East Carolina University where he specialized in elementary industrial arts on his master's degree. This included course work, research, and practical experience working with elementary children.

Mr. Pittman is an active member in professional organizations. He is an active member of the North Carolina Industrial Arts Association and the American Industrial Arts Association. He is a member of Epsilon Pi Tau, the international honorary fraternity in industrial and technical education, and he is a member of Kappa Delta Pi, an honorary professional education society.

Richard E. Drake served as a research assistant. He holds the B. S. degree with a major in industrial arts education from East Carolina University where he took courses in elementary school industrial arts, and he had some experience working with elementary children. Mr. Drake is a member of the North Carolina Industrial Arts Association, the American Industrial Arts Association, and Epsilon Pi Tau, the international professional fraternity in industrial and technical education.

Mrs. Patricia E. Braak served as a research assistant. She holds a B. S. degree with a major in elementary education from East Carolina University. Mrs. Braak has taken a number of courses in industrial arts education and has had practical experience working with children in elementary industrial arts.

Miss Pamela M. King served as a research assistant. She is a senior at East Carolina University majoring in elementary education. Miss King has had several courses in industrial arts education and has had practical experience working with children in an elementary school situation.

Mrs. Nan D. Howell, a senior majoring in English at East Carolina University, served as part-time secretary for the project. Her background in English and her outstanding secretarial abilities were an asset to the project.

CHAPTER IV

PRESENTATION OF DATA

References to industry and technology found in the elementary school textbooks were extracted and divided into the following six divisions: (1) Communications, (2) Transportation, (3) Construction, (4) Manufacturing, (5) Power, (6) Service. Items were listed as subtopics at various levels under the above basic classifications.

Items selected for listing under communications included any reference to ways by which man communicates that involves technological apparatuses. This included the various means of graphic communications in printing, photography, science and drawing, and the various means of electromechanical communications such as telephone, telegraph, teletype and television.

The area of transportation was concerned with the study of the various means by which man transports himself or goods. This included all methods of land, air, sea and space transportation.

The area of construction was concerned with building all types of structures, including houses, and bridges, roads and airports. The major criterion for selection of items in this area was that it must refer to activities in which a construction company would be involved.

Manufacturing was considered to be the changing of raw materials, or semi-raw materials, into useful products. Any reference to this type of activity, of manufacturing products and goods for man's consumption, was considered for this category.

All references to any source of power used for any of the above areas, communications, transportation, construction and manufacturing, was considered appropriate for the area of Power. This included simple forms of power such as wind and water through the development of earlier sources of steam power, the use of minerals for power, and the more sophisticated atomic power.

The technological influence on our society has created a need for services for the many products that have been provided. While an area of service was not originally included in the plans for this study, it became quite evident that this was an area of technological concern that is found in the elementary school textbooks, and that should be reflected in this outline. Any service related to communications, transportation, construction, manufacturing or the production of power was considered appropriate for this area.

Grade One

References to the areas of communications, transportation, construction, manufacturing and service were found in first grade textbooks. Transportation was the most frequently mentioned of the areas with information about land, air and water transportation. The second most frequently mentioned areas were construction and service. Very little reference was given to either manufacturing or communications and no reference was given to power. The following is an outline of all elements of industry found in first grade textbooks. The figures to the right of items in the outline indicate the reference to material for this item.*

I. Communications	
A. Telephone	13:128-133
II. Transportation	
A. Land	
1. Truck	2:88 12:53-54 5:78-82
2. Automobile	8:133 2:78-79
3. Bus	2:88
4. Train	12:88-91 7:67-68 7:132-137 2:74 2:77
B. Air	
1. Airplane	9:7-10 12:53-58
C. Water	
1. Tugboat	2:82
2. Ocean Liner	2:82
3. Ferryboat	2:83
III. Construction	
A. Cement	8:89-93
B. Painting	12.13-16 9:57-62
C. Hammers	9:57-62
D. Saws	9:57-62 2:59
E. Lumber	2:94
IV. Manufacturing	
A. Birdhouses	8:134
B. Chairs	7:39-43
C. Shoes	2:95

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*The number to the left of the colon indicates the book from which this reference was taken, and the numbers to the right of the colon indicate the pages. These numbers refer to the Grade One Bibliography found at the end of the report.

V. Service	
A. Automatic Car Wash	7:64-66
B. Street Cleaning	13:134-136
C. Mail Service	2:72
D. Fire Department	2:92
E. Garbage Collection	2:98

Grade Two

Technological information found in second grade textbooks fell into all six of the areas included in this report. The heaviest reference was to transportation in which land, water, and air transportation sources were discussed. Of these, the predominant emphasis was on land transportation of automobiles, trains and trucks.

A lesser degree of emphasis was placed on construction where references to materials used in house construction were found. Other areas received limited references. The following is a complete outline of elements of industry found in second grade textbooks.*

I. Communication	
A. Home Movies	5:130-133
B. Telephone	5:126-129 7:29
C. Television	7:8-12
II. Construction	
A. Houses	
1. Wood	9:4-5
2. Stone	3:61
3. Paint	7:14-18
4. Cement	8:114-119
5. Iron	8:219
B. Airport Runway	7:124
III. Manufacturing	
A. Shoes	3:56
B. Clothes	3:98
C. Wood	9:5 8:217
D. Milk Production	8:164-169
E. Bakery	8:183-186

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* The number to the left of the colon indicates the book from which this reference was taken, and the numbers to the right of the colon indicate the pages. These numbers refer to the Grade Two Bibliography found at the end of the report.

IV. Transportation	
A. Land	
1. Wheels	8:196-234
2. Dolly	5:113-119
3. Automobile	3:58 8:201-208 2:12
4. Bus	7:87 8:187-193
5. Train	8:187-193 3:85 8:217 8:209-213 8:84-91
6. Truck	4:39 4:28 8:173-178 8:218-223
B. Water	
1. Ocean Liner	3:104
2. Tugboat	3:104 8:187-193
C. Air	
1. Airplane	7:108 8:187-193 4:39
2. Helicopter	7:128
3. Spaceship - rocket	2:12
V. Power	
A. Compressed Air	5:91-94
B. Steam	8:224-233
VI. Service	
A. Milkman	3:60
B. Snowplow	5:133
C. Fire Fighting	7:111 8:187-193

Grade Three

References to technology found in the third grade books were in all six of the areas. As in the second grade, transportation was the most highly emphasized of the areas, and this was repetitious since the emphasis was on land, air, and water transportation as it was in the second grade.

Construction received emphasis with information included on materials that are used in construction and on some of the more common hand tools used in that area. Also, manufacturing was covered with discussions on the making of many common items such as bread, iron, glass, paper, clay products, and textiles.

Simple machines were discussed in considerable detail. This was included under the topic of power, because all of these machines contribute to the modification of the amount of power needed to do a job. Included in this were the wheel, ramp, wedge, and pully. Also electrical power, magnetic energy, and water power were included in this area. A complete outline of the elements of industry for grade three follows.*

I. Communication	
A. Letter Writing	1:83
B. Flags - semaphore	7:182
C. Telephone	9:66
D. Walkie-Talkie	7:184
E. Television	8:270
II. Construction	
A. Geometric Shapes	3:255-257
B. Wood	7:120 10:47-48 10:190
C. Iron	10:50
D. Pipes	10:120-125
E. Stone	10:42 10:47-48
F. Bricks and clay	8:152 10:53-59
G. Cement	10:35-36
H. Tools	
1. Saws	10:49
2. Hammers	10:49
3. Nails	10:49
4. Sandpaper	10:49
III. Manufacturing	
A. Bread	4:41
B. Milk	4:76
C. Iron	10:6 10:30
D. Glass	10:7
E. Paper	10:1
F. Clay Products: bricks, earthenware, procelain tile, dishes, etc.	10:63

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* The number to the left of the colon indicates the book from which this reference was taken, and the numbers to the right of the colon indicate the pages. These numbers refer to the Grade Three Bibliography found at the end of the report.

G. Food	9:27-28
	10:95
H. Textiles	10:112-113
	10:101
	10:110
	4:69
J. Rabbit House	5:68
K. Wigwams	2:47
IV. Power	
A. Simple Machines	
1. Wheel	10:18
	10:14
	10:11-13
	10:234-236
	10:235
2. Ramp	10:15-16
	10:11-13
	10:18
3. Wedge	10:239-241
	10:234-236
4. Pulley	10:17
	10:234-236
B. Electric	10:129-135
	10:266
	9:193-202
	10:69
C. Magnetic	10:165
D. Water	10:80
V. Transportation	
A. Land	
1. Trucks	4:45
	10:162
	9:96
	10:31
2. Train	10:162
	9:54-64
	10:96
	10:31
3. Automobile - taxi	4:45
4. Sled	1:167
B. Air	
1. Airplane	10:31
	10:96
	2:54
	6:115-116
	7:211
2. Helicopter	7:203-210
3. Rocket	10:2
C. Water	
1. Canoe	1:167
	4:63

2. Sailing ships	2:46
3. Freighter	10:162 10:31
VI. Service	
A. Water Service	10:82 10:88
B. Snow Plow	9:37
C. Blacksmith	4:104

Grade Four

References to technology in the fourth grade covered the areas of communication, power, transportation, construction, and manufacturing. No references to services were found. All five of these areas were discussed in considerable detail with communications being discussed least. References were found in at least two textbooks to the area of communications related to the telephone, radio, and television.

The area of power was given a fairly complete presentation with discussions ranging from muscle and wind power to rockets and atomic power. References to electrical power and the gasoline engine were discussed in considerable detail in three different textbooks. The area of transportation was again covered thoroughly. The sub-areas of land, air, and water transportation were included with considerable detail on the airplane and transportation by ocean-going freighters.

The areas of construction and manufacturing were both somewhat weak with construction being limited to housing in various parts of the world. Manufacturing was limited, for the most part, to single references of manufacturing many different items. The following is a complete list of the elements of industry for the fourth grade.*

I. Communication	
A. Telephone	4:98,104 4:233
B. Radio	4:98,104 4:236
C. Television	4:220
II. Power	
A. Wind	9:215-216 8:357 4:227

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* The number to the left of the colon indicates the book from which this reference was taken, and the numbers to the right of the colon indicate the pages. These numbers refer to the Grade Four Bibliography found at the end of the report.

B. Muscle	9:214 4:134 4:163
C. Water	9:217-218 9:220
D. Steam	9:229-231 9:132
E. Gasoline Engine	9:234-236 4:132 4:227 8:115
F. Electric	4:227 4:2 9:220-225
G. Rocket	9:31-46 9:257 8:155
H. Atomic	9:233
III. Transportation	
A. Land	
1. Rolling	
a. Friction - brakes	9:125-127 9:118
b. Wheels	9:115-117
c. Ball Bearings	9:122
2. Horse	4:189 4:46-47 8:45 2:226
3. Sled	4:74 9:109
4. Bicycle	4:240 7:14
5. Train	4:212 4:127 8:132 7:14
6. Automobile	4:141 8:115 7:30 4:189
7. Bus	4:46-47 7:14 1:29
8. Truck	4:189 4:200 4:129 7:14
B. Air	
1. Airplane	9:157 9:143-153

	4:85
	4:274
	3:37
	8:11
	8:122
	2:13-15
2. Helicopter	8:144
	9:150
3. Rocket	8:155
	9:257
	9:31-46
C. Water	
1. Paddle wheel boat	9:134
2. Flatboat	2:228
3. Canoe	4:1-6
	3:25
4. Sailing ships	8:357
	7:76
5. Ocean freighter	4:200
	4:218
	4:85-86
	4:148
	4:272
	4:245-246
6. Tankers	4:146
7. Rowboat	4:176
8. Submarines	9:137
IV. Construction	
A. Houses	
1. American Pioneers	2:207-212
	8:57
2. South American Jungle	9:105
3. Norway	4:112-113
	9:105
	4:97
4. South Pacific Islands	5:10-11
5. Alaska	3:24
6. Saudi Arabia	4:127
7. Argentina	4:200-201
B. Storehouses in Norway	4:97
C. Schools in India	4:175
V. Manufacturing	
A. Sugar	
1. Cane	4:179
2. Maple	7:70
B. Oil	4:145
	4:266
C. Clothing	
1. American Pioneers	2:207-212
2. Indian	7:48

D. Canoes	4:19-20
E. Candles	7:58
F. Wool	4:42-45
G. Basket Weaving	4:197 4:8-9
H. Boats - Whaling in Alaska	4:70-73
J. Bricks - Handmade	4:175-176
K. Date Products	4:133-134
L. Aircraft	4:269
M. Grapes	4:278-284
N. Fishing	4:254-258
O. Flowers - bulbs	4:248-251
P. Diamond Cutting	4:244
Q. Meat Products	4:218
R. Sunflower seed	4:202

Grade Five

References to elements of industry and technology from textbooks for the fifth grade were found in the six areas. However, the areas of communication, construction and service received relatively little mention, while the area of manufacturing was one of the strongest areas in this grade. Many references were found to the manufacturing of food products, wood products, including lumber, pulp, paper, furniture, cellulose, plywood and turpentine, and textiles, including cotton, wool and clothing, the manufacture of metal products using many different metals. Also included was the manufacture of glass products, automobiles, aircraft, rubber goods, petroleum products, machinery, chemicals, and medicine. The majority of these references were found in the social studies text with others coming from science and language arts books.

The area of transportation included air, land, and water travel with the greatest emphasis being on the airplane and the train. The following is a complete outline for technological information found for this grade.*

I. Communication

A. Motion Pictures	10:119-120 10:110-111 7:58 8:55
B. Mail	3:215
C. Maps	10:4
D. Television	6:26 10:16

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* The number to the left of the colon indicates the book from which this reference was taken, and the numbers to the right of the colon indicate the pages. These numbers refer to the Grade Five Bibliography found at the end of the report.

E. Telephone	
1. Standard	2:432
	1:210
2. Radio-Telephone	8:400
	9:24-25
F. Radio	10:16
	6:26
G. Phonograph	2:433
H. Radar	9:27
	9:312-313
I. Morse Code	
1. Telegraph	2:412-413
2. Signals (Mirrors)	8:191
J. Printing	9:229
	3:118
	2:130
II. Construction	
A. Houses	
1. Eskimo	10:159-160
2. Rio de Janeiro	10:460
3. Pioneers	2:193-195
	2:104-106
	2:179
	2:69
	2:85
	10:16
	10:41
B. Materials	
1. Wood	10:196
	10:139
2. Cement	9:54
	10:552
C. Railroad	10:95
	2:362-363
	10:148
D. Roads	10:46-47
	10:148
E. Water related Construction	
1. Canal	10:150
	10:417-418
2. Harbor	10:121
3. Locks	10:148
4. Fish Ladder	10:146
5. Dams	10:51
	10:84
	10:4
	9:149
6. Bridge	10:133

III. Manufacturing	
A. Foods	
1. Fruit and Vegetables	10:149 10:144 10:134 10:120 10:118 10:174-175 10:394 10:47
2. Sugar	10:508-509 10:164-165 10:94 10:385 10:242-243
3. Meat Packing	10:385 10:134 10:394 10:290 10:45 10:47 10:59 10:207 10:216
4. Dairy	10:394 10:28 10:30 10:32 10:44 4:33 2:371-373
5. Grain	
a. Production	6:59 10:79 10:23 10:19 10:290
b. Products	10:408 10:284 10:411 10:51 10:394 10:44
6. Seafood	10:150 10:254 10:176 10:145-146
B. Wood Products	
1. Lumber	10:208-209 10:139-142 10:197 10:147

	10:149
	10:5
	10:281-282
	10:266
2. Wood Pulp and paper	10:209
	10:200-201
	10:139-141
	10:157
	9:228
	3:132
	3:126-127
	3:112-113
	10:329-331
	10:295
	10:310
3. Furniture	10:268-269
	10:462
	10:200
	10:216
	10:385
	10:149
	10:200
4. Cellulose for plastics	10:200
5. Plywood	10:209
6. Turpentine	10:198
	10:480
7. Miscellaneous	
a. Boxes	10:216
b. Tool Handles	10:149
c. Baseball Bats	10:216
d. Doors and Window Frames	10:216
	10:99
e. Ladders	10:149
C. Textiles	
1. Cotton	
a. Harvesting	10:125
	10:205
b. Processing	10:533
	10:551
	9:230
c. Spinning and Weaving	4:198
	10:246
	2:317-320
	10:238
	10:459
2. Wool	10:236-238
	10:433
	10:268-269
	10:310

	3. Silk, Rayon, Nylon	10:238
		10:220
		10:310
	4. Clothing	10:59
		10:47
		10:198
		10:220
		10:462
		10:246
		10:207
D.	Metals	
	1. Iron and Steel	10:220
		10:464-465
		10:269-270
		10:411
		10:273-274
		10:394
		10:291
		10:254-255
	2. Copper	10:89-90
		10:98
		10:415
		10:97
	3. Aluminum	10:273-274
		10:54
		10:211-212
	4. Gold	10:159
		2:277-279
	5. Silver and lead	10:97
E.	Glass Products	10:270-271
		10:286
		10:273-274
		10:5
		9:62
F.	Automobiles	10:166
		10:201-202
		10:286-288
		10:306
G.	Aircraft	10:120
		10:201-202
		10:118
		10:48
H.	Rubber Goods	10:288-289
		10:478-480
I.	Ship Building	10:115-116
J.	Petroleum Products	10:116
		9:41
		10:61
		10:185-187
		10:181
		10:184

K. Leather Products	2:368 10:242-243 10:239 10:533 10:268-269 10:48
L. Jewelry	10:240
M. Machinery	10:47-48 10:94-95 10:285
N. Chemicals	10:181 10:187 10:284
O. Medicine	10:47 10:94-95
P. Photographic Equipment	10:273
Q. Electrical Supplies	10:552
R. Cigars and Cigarettes	10:533
IV. Power	
A. Water	10:99 10:459 10:198 10:237-238
B. Hydro-electric	10:183 10:103 10:118 10:148 10:84 10:8 9:265-266 10:533 10:220-221 10:332 10:310 10:305-306
C. Electric	10:90-91 1:41 9:289 9:286-287 9:279-281 9:275 9:264 10:246 10:284-285 9:256 9:257 2:373 9:226 10:218-219 10:198 10:339 10:4

D. Steam	10:53
	10:269
E. Human	6:50
F. Wind	9:15
	10:71
	9:71
	9:131-133
	10:16
V. Transportation	
A. Air	
1. Airplane	8:132
	2:421-425
	8:397-398
	9:29
	10:8
	10:50
	10:53
	10:162
	10:159
	10:154-156
	10:151
	10:173
	10:175
	10:177
	10:95
	10:381
	10:249
	10:431
	10:410
2. Helicopter	10:29
	3:1-7
3. Balloon	2:421-425
	3:18
4. Rocket	9:9
	8:356
	9:33
	9:31
B. Water	
1. Canoe	2:41-42
	10:154-156
	10:49
2. Raft	10:148
	2:240-242
3. Sailing Ships	2:290-293
	2:1-52
	10:3
	2:62
	10:109
4. Barges	10:52
	10:50-51

	10:286
	10:244
	10:263
	10:284
	10:206
	2:367
5. Steamboats	10:49
	2:240-242
	6:74-75
6. Ferryboat	6:74
7. Tankers	10:121
	10:188
8. Ocean Liner	10:249
	7:66
9. Freighters	10:121
	10:289
	10:290-291
	10:157
	10:148-149
	10:134
	10:180
	10:173
	10:237
C. Land	
1. Sled	6:172
	8:418
	10:154-156
2. Stagecoach	2:284
3. Wagon	2:235-236
	9:92
4. Bicycle	1:46-47
5. Train	10:20
	10:44
	10:5
	6:66
	8:274
	10:94
	10:255
	10:439
	10:436
	10:416
	10:120
	10:494
	10:387
	2:366
	10:322
	2:290-293
	10:50-51
	10:381
	10:159
	10:53
	10:58
	10:8

	10:177
	10:175
6. Truck	10:28
	10:124
	10:24
	10:8
	10:175
	10:177
	10:159
	10:381
	10:94
7. Automobile	10:249
	8:151-162
	8:60-71
	2:416
	10:2
	10:123
	10:8
8. Bus	10:249
	10:132
	1:45
9. Streetcar	10:132
VI. Service	
A. Garbage Collection	1:50
B. Policemen	1:50
C. Fire Department	1:50
D. Snow Plow	10:129
E. Newsboy	10:331

Grade Six

References to industry and technology were found in all six areas in sixth grade textbooks. However, references for services were limited to three items.

References to different kinds of communications were found in many sixth grade textbooks. These included simple communication devices such as writing and drawings. Also, it included information on printing, the telegraph, telephone, radio, television, newspaper, photograph and the tape recorder.

The area of construction dealt more with the construction of houses than any other one item. Also mentioned in this was the construction of bridges, dams, canals, roads, and railways.

References to manufacturing were found in many of the textbooks, and different types of products were represented there. Included in these were food products, textiles, forest products, metals, chemicals, glass, clay products, leather, petroleum, rubber, machinery, instruments and others.

References to different kinds of power were found at this grade level. Included were wind, water, electricity, steam, atomic and animal power. Also included was information on various kinds of engines used in the harnessing of some of these power sources.

References to transportation included land, sea and air transportation with the greatest emphasis being on trains and ships. The following is a complete outline for references at this grade level.*

I. Communication	
A. Drawings	4:9
	4:7
	9:47
B. Signals-Drums	9:47
	4:27-28
C. Writing	2:139
	4:97-98
	4:102-103
	4:75-77
	4:61
	4:9
D. Printing	4:319-322
	9:73
	9:76
	4:111
	9:74
E. Telegraph	3:28
	9:49
	10:251
	9:48
F. Telephone	8:293
	10:332
	2:141
	9:53
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Grade Seven

References were found in all six areas in grade seven textbooks. However, the areas of construction, power and service received little attention. The area of communication was somewhat repetitious of previous areas with the exception of communicating by mail and photography.

References to the area of manufacturing included such subtopics as textiles, wood products, tobacco, foods, metals, leather, equipment, jewelry, bricks, and ship building. The following is a complete list for this grade.*

*The number to the left of the colon indicates the book from which this reference was taken, and the numbers to the right of the colon indicate the pages. These numbers refer to the Grade Seven Bibliography found at the end of the report.

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Grade Eight

References to the elements of industry were found in the areas of communications, construction, manufacturing and power. Manufacturing was the area with the greatest frequency of reference. These were in the areas of manufacturing wood products, textiles, metals, chemicals, glass, oil products, rubber, leather, aircraft, automobiles, and electrical equipment.

Communications also received a high frequency of reference. These covered such things as newspaper printing, telegraph, telephone, phonograph, radio, photography, television, and radar. In transportation, the areas of the train, airplane, truck, and bus received the greatest number of references while a smaller number of references were found for animal transportation, wagon, bicycle, and motorscooter. There was also a high frequency of references to air transportation by airplane, and water transportation by various types of ships.

The area of construction received relatively few references. These were, for the most part, single references to such things as building, forts, pyramids, canals, bridges, dams, roads, and houses of various types and for various people.*

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C. Water	
1. Raft	1:380

2. Barge	7:287
3. Canoe	7:55
4. Boats	6:74
	6:51
	4:32
	2:350-58
	1:354
	1:127-33
	7:302
	6:84-85
5. Ships	
a. Sailing Ships	9:86
	11:8
	11:20
	3:165
	7:32
	7:47
	7:48
	7:157
	3:328
	1:523
	1:114-15
	1:427-34
	2:344-48
	2:148
	2:115
	7:363-70
	1:36-37
	3:234
b. Steam Ships	6:330-33
	4:263
	6:116
	6:64-65
	3:65-66
	1:207-211
	1:329-332
	6:107
	6:129
	1:178
	6:51
6. Submarine	1:181

Conclusions

Information derived by extracting the elements of industry found in the various basal textbooks for grades one through eight of North Carolina's public schools gives a list of technological subject matter included in the text material for each grade. An analysis of this material reveals that there is no logical sequential pattern of material being presented; there is much duplication at the various grade levels while there is no continuing continuity from one level to the next.

It must be concluded that this organization of the extracted elements of industry cannot be used as a course of study for industrial arts in the elementary grades. If this is to have any meaning or technological instruction for these grades, there must be further organization of the material. Chapter Five will reflect an attempt to select and reorganize the material presented here in a more logical presentation for an industrial arts course outline.

There is much information about industry and technology in the elementary school textbook from which information for this study was taken. Therefore, the conclusion that information about industry and technology is presented in modern textbooks must be drawn.

Even though information about industry and technology is present, these elements of industry do not fall into any particular pattern. It is necessary to revise and alter this collection of out-of-course content in order to develop a usable course outline. This analysis and revision is presented in Chapter V.

CHAPTER V

ANALYSIS OF DATA

After all data had been gathered and compiled into a systematic form, it was apparent that there was considerable repetition of references to industry and technology. It was determined that there was too much repetition for the previously presented outlines to be considered as course outlines and it was determined that some selection from these references would have to be made. The research design did not allow for any method of selecting and delimiting material to be covered in any of these grades.

Some of the revision was done in accordance with the judgement of the principal investigator. Most of the modifications in the course outline, however, were made according to the following criteria:

Criterion One: Any specific area of study repeated in the course outline for adjacent grades should be eliminated.

Criterion Two: An area to be retained should be so done in the grade that has the greatest amount of references for that area.

Criterion Three: An area to be retained should have the references from the greatest number of different sources.

Criterion Four: An area to be retained should be so done at the grade level where children will be able to effectively participate in activities appropriate to that area.

Criterion Five: Any additions to the course outline should be related to areas in the outline for the grades immediately preceding and following that grade, and they should contribute to the relatedness of the material in the respective grades.

The following revised course outline was derived by applying the above criteria to the unrevised outline. In addition to the outline and textbook references, some suggested activities and supplementary references are given. Numbers in the supplementary reference column refer to entries in the supplementary bibliography at the end of the report. These are but a few supplementary references and should be considered as the beginning of a supplementary bibliography.

GRADE I

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Transportation A. Land 1. Truck	2:88 12:53-54 13:78-82 8:133	Make models of transportation vehicles. Make diorama of city with emphasis on many kinds of transportation using models.	15 40 29 6
2. Automobile	8:133 2:78-79		
3. Bus	2:88	Emphasize the automobile as a most common machine, its use, and service.	
4. Train	12:88-91 7:67-68 7:132-137 2:74 2:77	Visit an automotive service center.	
II. Manufacturing A. Hammers	9:57-62	Learn how these tools are used in making things. This could be integrated with the unit on transportation. Finish with paint.	40
B. Saws--Crosscut, Coping, Back	9:57-62		
C. Painting	12:13-16 9:57-62	Children could paint some object in the room needing a fresh coat of paint.	
III. Service A. Automotive		Relate the mechanical developments in these services to society's needs, i.e., faster mail service, etc.	
B. Carwash	7:64-66		
C. Street Cleaning	13:134-136		29
D. Mail	2:72		

GRADE II

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Communications			
A. Telephone	5:126-129 7:29	Visit a telephone office and/or set up a telephone communication center in the classroom.	27
II. Construction			
A. Houses		Study the materials that go into building a house.	28
1. Wood	9:4-5		
2. Stone	3:61		
3. Cement	8:114-119	Build a model house using real materials.	
4. Iron	8:217		
5. Glass			
6. Paint	7:14-18	Visit houses under various steps of construction.	
III. Power			
A. Wind - Air	5:91-94	Build devices to use various forms of air-wind, compressed air. . .	28
B. Steam	8:224-233		
IV. Services			
A. Milkman	3:60	Study new technical developments in these services and compare advantages of new with old methods.	
B. Snow Plow	8:133		
C. Fire Fighting	7:111 8:187-193		

GRADE III

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Manufacturing			
A. Wood	7:120 10:47-48 10:190	Study, test, and experiment with the various materials used in manufacturing.	27
B. Tools			
1. Saws	10:49	Set up a mass production job to study about how industry produces products using tools, materials, and processing.	
2. Hammers & Nails	10:49		
3. Sandpaper	10:49		
C. Finishing			
1. Stain			
2. Lacquer & Shellac			
3. Paint			
D. Iron	10:6 10:50		
E. Glass	10:7		
F. Paper	10:1	Make paper.	25
G. Clay Products	10.63	Experiment with native clays and compare them with commercial clay.	
H. Food	9:27-28 10:112-113		
I. Textiles	10:101 10:110 4:69	Weave and knit with different yarns.	
II. Power			
A. Simple Machines			
1. Wheel	10:18 10:14 10:11-13 10:234-236 10:235	Make, compare, test, and experiment with simple machines.	
2. Ramp	10:15-16		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	10:11-13 10:18		
3. Wedge	10:239-241 10:234-236		
4. Pully	10:17 10:234-236		
B. Electrical Power	10:129-135 10:266 10:193-202 10:69	Build projects that will use and demonstrate simple uses of electricity such as buzzers, simple low voltage circuits with switches, motors, magnets, etc.	
III. Transportation A. Land 1. Trucks	4:45 10:162 9:96 10:31	Study and discuss truck and train uses, dispatching and scheduling. Develop model train or truck facility that requires control similar to a real one.	39 25
2. Train	10:162 9:54-64 10:96 10:31		
3. Automobile - Taxi	4:45		
4. Sled	1:167	Study old and current uses of sled. Compare sled with wheeled vehicle.	
B. Air 1. Airplane	10:31 10:96 2:54 6:115-116 7:211 7:203-210	Construct model of airplane or helicopter including as many actual likenesses as possible. Compare functions with those of trucks, trains, and ships.	25
2. Helicopter			
3. Rocket	10:2	Build and fire small rocket.	
C. Water 1. Canoe	1:167 4:63	Compare functions with those of trucks, trains, or airplane.	27

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
2. Sailing Ships	2:46		
3. Freighters	10:162		
	10:31		

GRADE IV

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Power			
A Animal	9:214	Discuss and test natural power	
	5:134	sources -- compare these with each	
	5:163	other and more sophisticated sources.	
B. Wind	9:215-216		
	1:357		
	5:227		
C. Water	9:217-218		
	9:220		
D. Steam	9:229-231		
	9:132		
E. Electric	5:227		19
	5:2		
	9:220-225		
F. Gasoline Engine	9:234-236		
	5:132		
	5:227		
	1:115		
G. Rocket	9:31-46		
	9:257		
	1:155		
H. Atomic	9:233		
II. Transportation			
A. Land			
1. Rolling		Make dolly or some source of trans-	
a. Friction - brakes	9:125-129	portation of goods using technology	20
	9:118	to reduce friction.	
b. Wheels	9:115-117	Compare with the following methods	22
c. Ball Bearings	9:122	of transportation to see how friction	
2. Horse	5:189	is reduced and improved transportation	
	5:46-47	is possible	

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	1:45	Build models of these to learn more of the details and functions of the various vehicles.	
	2:226		
3. Sled	5:74		
	9:109		
4. Bicycle	10:178		
	5:240		
	4:14		
5. Train	5:212		34
	5:127		
	1:132		
	4:14		
6. Automobile	4:141		
	1:115		
	4:30		
	5:189		
7. Bus	5:46-47		
	4:14		
	6:29		
8. Truck	5:189		
	5:200		
	5:129		
	4:14		
B. Air			
1. Airplane	9:157	Study and compare the three methods of air transportation.	
	10:200		
	10:216		
	9:143-153	Make working models of each.	
	5:85		
	5:274		
	7:37		
	10:43-44		
	10:214		
	1:11		
	1:122		
	2:13-15		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
2. Helicopter	1:144		
	9:150		
3. Rocket	1:55		
	10:201		
	9:257		
	9:31-46		
C. Water			
1. Paddle Wheel Boat	9:134	Make models of as many different types of water vessels as possible. Compare them from the stand point of basic operations, power, functions, and efficiency.	
2. Flatboat	2:228		
3. Canoe	5:1-6		38
	7:25		
4. Sailing Ships	10:250		
	1:357		
	4:76		
5. Ocean Freighters	5:700		
	5:218		
	5:85-86		
	5:148		
	5:272		
	5:245-246		
6. Tankers	5:146		
7. Rowboat	5:176		21
8. Submarines	9:137		
III. Construction - Houses			22
A. American Pioneers	2:207-212	Make models of homes from the different countries. Compare from the stand point of materials, construction methods, and cultural effect on houses.	
	1:57		
B. South American Jungle	9:105		
C. Norway	5:112-113		
	9:105		
	5:97		
D. South Pacific Islands	5:10-11		
E. Alaska	7:24		
F. Saudi Arabia	5:127		
G. Argentina	5:200-201		

GRADE V

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Construction			
A. Materials			
1. Wood	4:196	Build models of various types of construction using the same materials as would be used on the actual job whenever possible. Also, make working models if possible.	24
	4:139		
2. Cement	10:54		
	4:552		
B. Railroad	4:95		
	5:362-363		
	4:148		
C. Roads	4:46-47		
	4:148		
D. Water Related Construction			
1. Canal, locks	4:150		
	4:148		
	4:417-418		
2. Harbor	4:121		
3. Dams	4:51		
	4:84		
	4:4		
	10:149		
4. Bridges	4:133		
II. Manufacturing			
A. Foods			
1. Fruit and Vegetables	4:149	Process typical examples of the various types of foods and compare procedures.	4 5 9
	4:144		
	4:134		
	4:120		
	4:118		
	4:174-175		
	4:394		
	4:47		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
2, Sugar	4:508-509	Obtain some sugar cane for beets and make some sugar in class.	
	4:164-165		
	4:94		
	4:385		
	4:242-243		
3. Meat Packing	4:385		
	4:134		
	4:394		
	4:290		
	4:45		
	4:47		
	4:59		
	4:207		
	4:216		
4. Dairy	4:394		
	4:28		
	4:30		
	4:32		
	4:44		
	8:33		
	5:371-373		
5. Grain			
a. Production	9:59		
	4:79		
	4:23		
	4:19		
	4:290		
b. Products	4:408		
	4:284		
	4:411		
	4:51		
	4:394		
	4:44		
6. Seafood	4:150		
	4:254		
	4:176		
	4:145-146		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
B. Wood Products			
1. Lumber	4:208-209	Visit a sawmill. Build a model	36
	4:139-142	sawmill.	
	4:197		
	4:147		
	4:149		
	4:5		
	4:281-282		
	4:266		
2. Wood Pulp and Paper	4:209	Make paper.	
	4:200-201		
	4:139-141		
	4:157		
	10:228		
	2:132		
	2:126-127		
	2:112-113		
	4:329-331		
	4:295		
	4:310		
3. Furniture	4:268-269	Build small pieces of furniture or	
	4:462	models of furniture.	
	4:200		
	4:216		
	4:385		
	4:149		
	4:200		
C. Textiles			
1. Cotton			
a. Harvesting	4:125	Grow,(or visit cotton field)harvest and	
	4:205	process cotton.	
b. Processing	4:533		
	4:551		
	10:230		
c. Spinning and Weaving	4:198	Make simple equipment to spin and	
	4:246	weave cloth.	

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	5:317-320		
	4:238		
	4:459		
2. Wool	4:236-238	Spin and weave wool and compare with cotton.	
	4:433		
	4:268-269		
	4:310		
3. Silk, Rayon, Nylon	4:238	Compare synthetic fibers with natural ones.	
	4:220		
	4:310		
4. Clothing	4:49		
	4:47		
	4:198		
	4:220		
	4:462		
	4:246		
	4:207		
III. Power			
A. Hydro-electric	4:183	Make a model of a dam with a hydro-electric generator. Measure output.	
	4:103		
	4:118		
	4:148		
	4:84		
	4:8		
	10:265-266		
	4:533		
	4:220-221		
	4:332		
	4:310		
	4:305-306		
B. Electric	4:90-91	Make a model of some form of electrical equipment, such as an electric motor, buzzer, heater, light circuit, etc.	25
	7:41		37
	10:289		
	10:286-287		
	10:279-281		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	10:275		
	10:264		
	4:246		
	4:284-285		
	10:256		
	10:257		
	5:373		
	10:226		
	4:218-219		
	4:198		
	4:339		
	4:4		

GRADE VI

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Communications			
A. Writing	2:139		16
	4:97-98		
	4:102-103		
	4:76-77		
	4:61		
	4:9		
B. Electronic			
1. Radio	9:276	Build radio.	
	9:263		
	1:15		
	9:61		
	9:255		
	9:66		
	9:65		
	10:13		
2. Television	2:139	Visit television station. Produce TV program on vidio-recorder.	2
	8:114-127		
	7:16		
C. Electrical			
1. Telegraph	3:28	Set up telegraph communication system.	25
	9:49		
	10:251		
	9:48		
2. Telephone	8:293	Set up telephone communication system.	
	10:332		
	2:141		
	9:53-54		
	9:56-59		
	6:15		
	9:255		
	9:66		
II. Construction			
A. Houses	9:292	Study construction material.	46

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	4:216-220		
	4:15	Build models of different types of houses.	
	4:173		
	4:183		
	4:211	Visit construction sites.	
	4:248		
	4:105		
	4:95		
	4:10		
	2:195		
	10:27		
	10:35		
	10:209		
	10:234		
	10:244-245		
	10:248		
	10:253		
	10:303		
	10:306		
	4:79-80		
	8:11		
	4:31		
	4:57-58		
B. Bridges	9:286-297	Build models of early bridges.	46
	4:187-188		
	4:111		
C. Roads	4:187-188		
	4:111		
III. Manufacturing			
A. Metals			
1. Iron & Steel	10:274	Build model of refining processes	16
	10:94		
	10:31-32	Collect samples of different kinds of iron and steel.	
	10:211		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	10:79		
	10:68	Work with various metals (projects may be made) to discover characteristics.	
	10:60		
	10:144		
	10:301		
	4:171		
	10:238		
	10:323		
	10:275		
	10:108		
	10:114		
	10:130		
	10:73		
	10:203		
	10:193-194		
	10:33	Experiment with various metals. Test for hardness, wear, flexibility, ets.	
	7:61		
	6:143		
	10:60		
2. Copper	10:310		
	10:324		
	10:258		
	4:96		
	4:230	Apply various processes to different metals; spinning, turning, cutting, etc.	
	4:171		
	10:108		
	10:203		
3. Gold	10:274		
	10:323		
	10:211		
	10:247		
	4:104		
	4:100		
	10:258		
	10:108		
	10:203		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	10:310		
4. Silver	4:230		
	4:104		
	4:100		
	10:108		
	10:203		
5. Tin	10:310		
	10:211		
	4:171		
	10:206		
	10:215		
6. Zinc	10:301		
	4:171		
7. Lead	10:274		
	10:104		
	10:301		
8. Chromuim	10:203		
	10:165		
9. Manganese	10:203		
	10:301		
10. Bronze	4:69		
11. Brass	4:230		
12. Metal Goods	10:47		
	10:316		
	4:58-59		
	4:74		
	4:255		
	4:137-138		
	4:154-155		
	10:43		
B. Glass	4:86	Make model on poster of glass manufacturing.	
	10:108		
	10:193		
	10:60	Collect samples of raw materials used.	
	10:65		
	10:35		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	4:100		
	10:79		
	10:47		
C. Clay Products			
1. Pottery	4:23-24	Collect native clay, form, and fire in kiln.	
	8:425		
	9:224		
	10:60		
	10:249		
	10:308		
	4:112		
	4:59		
	4:255		
	4:137-138		
	4:154-155		
2. China	10:76		
	4:86		
	10:52		
D. Coal	10:237		
	10:233		
	10:60		
	10:73		
	10:323		
	10:247		
	10:310		
	10:211		
	10:274		
E. Petroleum	10:112		
	10:286		
	10:172-173		
	10:206		
F. Chemicals	10:33		
	10:43		
	10:38		
	10:104		
	10:81		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	10:249		
	10:76		
	10:170		
	10:108		
	10:65		
	10:60		
	10:144		
IV. Power - Engines			
A. Steam	9:305	Assemble as many different kinds of model engines as are available and compare as to efficiency and practibility of each.	11
	10:229-330		
	9:313		
	9:334		
B. Gasoline	9:314-316		23
	9:305		
C. Diesel	10:67		
	9:317		
D. Rocket	9:320-321		
E. Jet	9:319-320		
F. Gas Turbine	9:311		
V. Services - Water System	2:127	Build working model using actual materials.	
	1:150-151		

GRADE VII

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Communications			
A. Newspaper	10:26 6:183-184 6:46-47 9:414 9:41	Visit a newspaper and then print class paper using available reproduction methods.	35
B. Photography	1:5 8:237-245 2:154-155	Take and develop pictures using simple and/or pin hole camera. Hold photo contest.	
II. Construction			
A. Houses	9:119 9:114 9:49 9:20-23 9:216	Make model house with scale lumber, etc. Visit house construction site.	
B. Bridges	11:182-189 11:45-47	Study types of bridges (old & new) and build models.	48
C. Roads	9:246 11:170 7:119		
III. Manufacturing			
A. Metals			
1. Iron	9:275 9:210 9:253	Make models of different refinery equipment. Collect samples of different types of iron and steel.	44
2. Gold	11:140 6:70		
B. Wood Products			
1. Lumber	1:232 9:423-424 1:234 9:252-253	Work with wood observing its characteristics. Wood projects may be made.	43

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	9:277	Visit a lumber mill and construct	
	9:210	a model.	
2. Paper	9:210	Make paper from wood pulp.	
	10:72		
	1:95		
	1:54		
	9:377		
3. Furniture	9:377	Make model furniture observing joints	
	9:337	and other construction features.	
	9:110		
	9:339-340		
C. Tobacco	9:337-340	Process cured tobacco leaves.	
	9:110		
	9:376		
	9:252-253		
	1:60		

GRADE VIII

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
I. Manufacturing			
A. Wood products			
1. Lumber	6:376-381 6:366-367 6:187-189 6:154 6:131-132 6:110 6:101 3:151 9:74	Make objects from wood and other materials Set up mass production of an item. Include management, research and development, production sales, etc.	33 17
2. Paper	7:467-468 6:62 12:179 6:376-381		
3. Plywood	6:306-317 6:154		
4. Furniture	6:62 6:175		
5. Tannin	6:68		
B. Food Products			
1. Seafood	7:53 6:318-324 6:382-383 6:110 6:187-189		
2. Food Processing	6:97 6:62 6:125 6:114-115 6:85 6:73		
3. Meats	6:80 6:296-305 6:372-374		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
4. Fruits & Vegetables	6:371-372		
	6:268-296		
	6:86		
5. Dairy	6:80		
	6:91		
6. Sugar	6:168		
	6:175		
C. Textiles			
1. Cotton	6:161	Set up loom and weave with various patterns in different materials .	
	7:467-468		
	6:114-115		
	6:268-296		
2. Wool	6:372-374		
	7:296-308		
	6:101		
3. Clothing	7:103		
	3:285		
	6:97		
	6:125		
	6:91		
II. Power			
A. Animal	3:285	Harness as many of these sources of power as possible to simple machines.	12
	3:174		
B. Wind	3:285		
C. Water	3:285		
	6:238		
	5:25		
D. Electric	6:74		
	4:52		
	7:641-643		
	7:140		
	1:447-455		
	5:455-456		
	6:238		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
E. Atomic	2:239-245 6:238 1:176A-176D 1:167-171 3:104-105 10:36-37		
F. Petroleum	6:238 6:74		
G. Coal	6:236		
III. Transportation			
A. Land			
1. Train	6:51 4:201 11:12 7:363-370 1:36-37 1:178 6:64-65 6:74 6:81 6:91 7:101 7:116 6:127 6:132-133 6:150-151 6:330-333 4:263	Set up model train layout with a minimum of two circuits. Operate with dispatcher. The more complex the layout, the more it will help pupils to understand the complexity of trains and the railroad.	13 17
2. Automobile	6:101 6:81 6:74 6:64-65 4:32 4:279 4:293	Study the various systems of the automobile, truck, and bus. Make working models whenever possible and compare the differences between the three in light of the function of each.	8

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	4:341		
	7:632-638		
	6:84-85		
	2:416-420		
	2:134-135		
	5:371		
	5:412		
	4:263		
	6:330-333		
	6:132-133		
	6:127		
	6:116		
3. Trucks	6:330-333		
	6:84-85		
	4:97		
	6:57		
	6:64-65		
	6:74		
	6:81		
	6:101		
	6:116		
	6:127		
	6:132-133		
4. Bus	6:127		
	6:81		
	4:15		
	6:84-85		
	5:418		
	4:263		
	6:330-333		
B. Air			
1. Airplane	4:351 4:33 6:173	Study effects of aerodynamics. Build simple wind tunnel and test model planes.	
	9:26 9:38	Design and fly models to test different designs.	

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	9:82		
	10:26-27		
	7:639-641		
	1:462-607		
	1:192-199		
	2:180-190		
	6:91		
	6:64-65		
	6:116		
	6:132-133		
	6:81		
	6:84-85		
	4:263		
	6:330-333		
2. Helicopter	1:243		
3. Rocket	4:97		
	2:248-58		
	2:260-262		
	1:248-254		
	1:212-215		
	4:169		
	4:213		
C. Water			
1. Boats	6:74		
	6:51		
	4:32		
	2:350-358		
	1:354		
	1:127-133		
	7:302		
	6:84-85		
2. Ships			
a. Sailing Ships	9:86		
	11:8		
	11:20		

COURSE OUTLINE	REFERENCES	SUGGESTED ACTIVITIES	SUPPLEMENTARY REFERENCES
	3:165	Build model sailing ship and test it with artificial power (wind) sources.	
	7:32		
	7:47		
	7:48	Sail boat, if possible to become familiar with the problems of sailing.	
	7:159		
	3:328		
	1:523		
	1:114-115		
	1:427-434		
	2:344-348		
	2:148		
	2:115		
	7:363-370		
	1:36-37		
	3:234		
b. Steam Ships	6:330-333		
	4:263		
	6:116		
	6:64-65		
	3:65-66		
	1:207-211		
	1:329-332		
	6:107		
	6:129		
	1:178		
	6:51		
c. Submarine	1:181		

Conclusions

The preceding course outline is a revised outline for elementary school industrial arts based on references found in textbooks on the North Carolina elementary school basal adopted list. This will provide a course of study covering six categories of industry and technology: transportation, manufacturing, construction, communication, power, and service. This outline should provide the teacher with an organization appropriate and sufficient for providing her students with information about our technological society and the world of work.

This outline is but the first step in providing a curriculum appropriate for the needs of children in today's society. It appears to be comprehensive and complete in its written but untested form. The validity of this outline, however, cannot be determined until it has been used and tried in the classroom situation; changes are expected to be needed when this is implemented in the elementary school classroom. At the writing of this report, this course outline is being implemented in one school district, and this should aid in determining its value. Suggestions and recommendations are invited from any who use any or all of this course outline for elementary school industrial arts.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

A few conclusions and recommendations have been discussed throughout the study. These will be summarized in this chapter, and additional conclusions and recommendations will be made.

Conclusions

The major conclusion to be drawn from this study is that there are references to industry and technology in the elementary school textbooks on the North Carolina basal adoption. (It is assumed that similar references would be found in other elementary school textbooks.) Authors of these books have attempted to have them reflect the nature of contemporary society, and in so doing they reflect the technological aspects of present day society.

Children need to know about the society in which they live. It is not enough that information reflective of our society be presented in written form in books where the only interaction most children have with this information is through visual contact with the printed word. This information about the world in which we live must become meaningful to children by providing many different activities that will promote understanding. This study about our technologically centered society is the study of industrial arts, and industrial arts should be a part of the curriculum for every boy and girl.

The course outline for elementary school industrial arts, as derived from elementary textbooks, was found to be not suitable for use in the elementary school because it was too repetitious. The conclusion was drawn that revision of this was needed before a suitable course outline could be developed. Some revision was attempted in accordance with the judgement of the principal investigator, but additional modification, based on classroom testing of the outline, is still needed.

Recommendations

The following are recommendations to elementary school teachers and administrators and industrial arts personnel based on the findings of this study.

1. The elements of industry are a vital part of the public school curriculum; it should be a part of the education for all children; and it is recommended that all elementary school administrators incorporate into their curriculum a study of the industrial and technological aspects of our society.

2. Since it is imperative that the well-educated child learn about the technological nature of society, it is recommended that all

elementary school teachers make a concerted effort to emphasize references to industry in other subject matter areas by involving the child with manipulative activities related to the reference to industry.

3. The modified course outline for elementary school industrial arts, developed through this study, offers a comprehensive program of industrial arts for grades one through eight, and it is recommended that this serve as a minimum course content for elementary school industrial arts.

4. It is recommended that school personnel, using textbooks for the elementary school other than those used in this study, survey their texts to determine the elements of industry and technology presented in them and the degree of correlation between these texts.

5. It is recommended that the revised course outline be adopted as a minimum elementary school industrial arts curriculum without regard to textbook references.

6. It is recommended that all who use the revised elementary school industrial arts course outline, revise and improve upon it and that all suggestions for improvement be forwarded to the principal investigator of this study in order that modifications might be coordinated.

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APPENDIX

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IDENTIFIERS

ABSTRACT

The problem to which this study was directed was the development of an industrial arts course of study for the elementary grades of one through eight. The primary objective was to extract references to industry and technology from elementary textbooks and to construct a course outline from these.

"Elements of industry" were identified and extracted from the elementary school textbooks on the North Carolina basal adoption. These were divided in the areas of manufacturing, construction, communication, transportation, power, and service.

Considerable repetition between grades was found, and refinement had to be made. This was done on the basis of the judgment of the principal investigator and criteria that were set up. Reorganization eliminated duplication of topics in adjacent grades and placed topics where they could best be handled by children.

The result of the study was a course outline for elementary school industrial arts through which other elementary school subjects could be correlated and which would provide an emphasis on the industrial and technical aspects of modern society appropriate for teaching children knowledge and skills that will help them adjust to the evolving technological culture.